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THE PLANT DISEASE REPORTER

Issued by

THE PLANT DISEASE SURVEY, DIVISION OF MYCOLOGY AND DISEASE SURVEY
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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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Potato late blight, page 549, continues to expand its base of operation. T. W. Bretz reports an epiphytotic in Western Missouri, the first known occurrence in this State. W. D. Valleau reports the first observation on the early crop in Kentucky. Potentially epiphytotic conditions exist in Illinois and in Nebraska, according to M. B. Linn and to C. M. Slagg, respectively.

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Harley English, page 559, reports fungi isolated from moldy sweet cherries in the Pacific Northwest.

Results of a survey for fire blight in pear orchards in California are reported by Henry Schneider, page 566.

George L. Zundel reports that the "brown berry" symptom on raspberries in Pennsylvania is associated with mild streak, page 567.

M. T. Hilborn reports occurrence of strawberry red-stele disease in Maine, page 569. T. W. Bretz reports strawberry diseases observed in Missouri.

Pythium as a cause of seedling disease of flax is reported from Arizona by Wm. G. Hoyman, page 569. Byron R. Houston, page 570, reports damage caused by Fusarium wilt and curly top in California flax fields, and with Ernest H. Stanford, page 572, describes methods and results of varietal resistance tests with flax anthracnose.

CHECK LIST REVISION

Freeman Weiss

SORGHASTRUM (GRAMINEAE)

SORGHASTRUM NUTANS (L.) Nash, INDIAN GRASS (1). Tall perennial of prairies and open woodlands occurring from the Atlantic coast to the eastern Great Plains, and at low altitudes to Ariz. and Wyo.; an important constituent of prairie hay. S. ELLIOTTII (Mohr) Nash (2), SLENDER I. G., occurs in the South Atlantic and Gulf States.

Cerebella andropogonis Ces., secondary head mold associated with ergot. Ala., Ark., Kans., Miss., Tex. (1)
C. sorghi Tracy & Earle (? synonym of preceding). Miss. (1)
Cladosporium graminum Cda., leaf mold. Ala.
Claviceps purpurea (Fr.) Tul., ergot. Kans., Okla., Tex.
Colletotrichum graminicolum (Ces.) G.W.Wils., anthracnose. Kans. (1)
Ellisiella caudata (Pk.) Sacc., on old leaves. N.J. (1)
Phyllachora luteo-maculata (Schw.) Orton, tar spot. Iowa, Tex.
Puccinia virgata Ell. & Ev. (II,III), rust. Pa. to Fla., Tex., Nebr. and Wis. (1). O and I unknown.
Pythium arrhenomanes Drechs., root browning. N.Dak. (1)
Septogloeum bartholomaei (Pk.) Wr., on leaves. Kans. (1)
Sphacelotheca chrysopogonis Clint., seed smut. Md. (1)
S. sorghastri Zundel, head smut. Ga., Va. (2)
Tolyposporella chrysopogonis Atk., leaf smut. Ala., Kans., Nebr., Tex. (1)

SORGHUM (GRAMINEAE)

SORGHUM HALEPENSE (L.) Pers., JOHNSON GRASS. Perennial of Mediterranean origin, widely established in warm regions throughout the world; in the U.S. cult. for forage mostly in the South but naturalized north to Mass. and west to Iowa, Tex. and Calif., often becoming a weed but furnishes food for wildlife.

Ascochyta sorghina Sacc., leaf spot. La., Ga., N.Car.
(Bacillus sorghi Burr., Bacterium andropogoni E.F.Sm.): Pseudomonas andropogoni
Cercospora sorghi Ell. & Ev., leaf spot. Gulf States, Nebr., S.Dak., Tenn.
Colletotrichum falcatum Went and C. graminicolum (Ces.) G.W.Wils., anthracnose. N.Car. to Ind., Fla. and Tex; P.R. See note on these names under S. vulgare. Records of C. lineola Cda. on this host probably belong here.
Cuscuta sp., dodder. Tex.
Gibberella zeae (Schw.) Petch, on culms. Ga.
Gloeocercospora sorghi D.Bain & Edg., zonate leaf spot. La., Miss.
Helminthosporium sp., leaf spot. Minn.
H. sorghi Schw., leaf spot. Tex.

SORGHUM HALEPENSE conc.

Helminthosporium turcicum Pass., leaf blight. N.Car. to Ala. and Tex.; Ohio

Phyllosticta sorghina Sacc., leaf spot. Tex.

Pseudomonas andropogoni (E.F.Sm.) Stapp, bacterial stripe. Ark., Kans., La., Mo., N.Mex., Tex. Records of Bacillus sorghi Burr. probably belong here for the most part; additional localities thus reported are Iowa, Nebr., Utah, Wash.

P. syringae van Hall (P. holci Kendr.), bacterial eye spot. Iowa, N. Dak.

Puccinia purpurea Cke. (II,III), leaf rust. S.Car. to Fla., Tex. and Okla.; Calif., Hawaii, P.R. O and I unknown

Ramulispora andropogonis Miura, leaf spot. Ala., La. Has also been reported as Titaeospora andropogonis (Miura) Tai

Septoria pertusa Heald & Wolf, leaf blight. Tex.

Sphacelotheca cruenta (Kuehn) Potter, loose kernel smut. Ariz., Ark., Calif., Okla., Tex., Utah

S. holci Jacks., kernel smut. Tenn.

S. sorghi (Lk.) Clint., covered kernel smut. Ariz., Calif., Ind., Kans., N.Mex., S.Dak., Tex., Wash.

Uromyces andropogonis Tracy (II,III), rust. Tenn. O and I on Viola spp.

Xanthomonas holcicola (Elliott) Starr & Burkh., bacterial streak. Tex.

SORGHUM VIRGATUM (Hack.) Stapf, TUNIS GRASS. African annual, under test in U.S. as forage grass.

Mosaic -- Marmor sacchari Holmes (Saccharum virus 1 K.M.Sm.). Hawaii

SORGHUM VULGARE Pers., SORGHUM. Robust annual cult. since pre-history for grain, syrup, and forage. The numerous forms fall into several principal groups to which botanical names have been applied as (1) var. CAFFRORUM (Thunb.) Hubb. & Rehder, KAFIR; (2) var. DURRA (Forsk.) Hubb. & Rehder, DURRA, FETERITA; (3) var. ROXBURGHII (Stapf) Haines, SHALLU; (4) var. SUBGLABRESCENS (Steud.) A.F.Hill, MILO; (5) var. SACCHARATUM (L.) Boerl., SORGHO; (6) var. TECHNICUM (Koern.) Jav., BROOMCORN; (7) var. SUDANENSE (Piper) Hitchc., SUDAN GRASS. These groups are connected by intergrading forms and can not be consistently separated but the following general section includes all the grain sorghums (groups 1 to 4); the remaining groups are separately listed.

Alternaria sp., secondary leaf spot and seedling blight. Ark., Utah. Macrosporium ornatissimum Ell. & Barth. reported "on leaves" or sometimes as "leaf spot" in Kans., Minn., and N.Y. belongs to Alternaria tenuis Nees and is saprophytic according to Elliott.

Ascochyta sorghina Sacc., leaf spot. Ala., Fla., Ga., Miss., N. & S. Car., Okla.

Aspergillus spp., head mold, seed rot, secondary seedling blight. Cosmopolitan.

Bacillus sorghi Burr. See Pseudomonas andropogoni, P. syringae, and

SORGHUM VULGARE cont.

Xanthomonas holcicola; these organisms separately or mixed cause "bacterial blight".

Bacterium rubrisubalbicans Christopher & Edg., mottled stripe. La.

Cercospora sorghi Ell. & Ev., leaf spot. Va. to Fla., La. and S. Dak.

Cladosporium herbarum Pers. ex Lk., leaf mold. Cosmopolitan.

Colletotrichum falcatum Went, leaf spot, red rot. This sp. has been definitely identified on sorghum in the Southern States and has been reported from others, as Minn. and W.Va. Some authors believe this to be the most frequent cause of this disease in the South. Conidial stage of Physalospora tucumanensis Speg.

C. graminicolum (Ces.) G.W.Wils., anthracnose, sometimes seedling blight. General, except perhaps in the South. Frequently reported as C. lineola Cda., a name of doubtful significance; some material thus identified belongs here, some probably to C. falcatum.

Diplodia natalensis Pole-Evans, seedling blight. Tex. Conidial stage of Physalospora rhodina (Berk. & Curt.) Cke.

Fusarium spp., head mold, secondary leaf spot, secondary root rot, seedling blight. Cosmopolitan. Specific identification often lacking or doubtful but the following reported: F. equiseti (Cda.) Sacc., F. oxysporum Schlecht. emend. Snyder & Hansen, F. scirpi C.R.Lambert & Fautry, var. acuminatum (Ell. & Ev.) Wr. and var. longipes (Wr. & Reinking) Wr., associated with root decay.

F. moniliforme Sheldon, seedling blight, top rot. Calif., N.Dak., Kans., Okla., Tex.

Gloeocercospora sorghi D.Bain & Edg., zonate leaf spot. Fla., La., Miss., Tex.

Helminthosporium sativum Pam. King & Bakke, root rot. Minn., N.Dak., Okla.

H. sorghi Schw., leaf spot. N.Car.

H. sorghi Cke. (= H. cookei Sacc.) also has been reported on culms of Sorghum sp. in N.Car.

H. turcicum Pass., leaf blight. N.Y. to Fla., Tex. and Wis.

Heterodera marioni (Cornu) Goodey, rootknot. Hawaii.

Macrophomina phaseoli (Maubl.) Ashby, charcoal rot, ? seedling blight. Okla. See also Sclerotium bataticola.

(Macrosporium ornatissimum Ell. & Barth.). See Alternaria

Nigrospora sphaerica (Sacc.) Mason, secondary stalk rot, shredding. Calif.

Penicillium spp., mold of grain and hay. Ark., Tex. Seed rot, cosmopolitan.

Phoma sp., associated with seedling blight and root rot. Ark., Okla.

(P. insidiosa Tassi): Phyllosticta sorghina

P. terrestris Hansen, secondary root rot. Iowa, Nebr., N. & S.Dak.

Phyllosticta sorghina Sacc., leaf spot. Fla., La., Mo., Okla. Tex.

Pseudomonas andropogoni (E.F.Sm.) Stapp, bacterial stripe. General in the Central States to Ala. and Tex., also Conn., Va., Ariz., Calif., N. Mex.

P. lapsa (Ark) Starr & Burkh., stalk rot. Calif.

SORGHUM VULGARE cont.

Pseudomonas syringae van Hall (P. holci Kendrick), bacterial eye spot. Ind. to Miss., Ariz. and Mont.; most frequent in northern Plains States.

Puccinia purpurea Cke. (II,III), leaf rust. General in U.S., also in Hawaii and throughout the West Indies. O and I unknown.

Pythium spp., root rot, milo disease. Widespread but most frequent in the southern Plains States to Tex. and Calif. P. arrhenomanes Drechs. is considered the most important cause and has been reported in this connection in Ark., Calif., Colo., Kans., N.Mex., N.Dak., Okla. and Tex. Other Pythium spp. identified on sorghum are: P. debaryanum Hesse, N.Dak.; P. graminicolum Subr., Iowa; P. ultimum Trow, Calif., Mo.

Ramulispora andropogonis Miura, leaf spot. Ala., Ark., La., Miss., Okla.

Rhizoctonia solani Kuehn, secondary root rot, leaf sheath rot. Okla., Tex., and doubtless general, but a minor disease factor on this crop.

Sclerotium bataticola Taub., charcoal rot, dry root rot. Ark., Kans., Nebr., Okla., Tex. These reports are of the sclerotial stage only; for pycnidial stage see Macrophomina phaseoli.

S. rolfsii Sacc., southern sclerotial rot. Ga., La.

Sphacelotheca cruenta (Kuehn) Potter, loose kernel smut. Widespread (Central and Southern States to Calif.) but infrequent except on kafir and milo varieties.

S. reiliana (Kuehn) Clint., head smut. Central and Southern States to Calif. and Wash., occasional in East.

S. sorghi (Lk.) Clint., covered kernel smut. General.

Spicaria elegans (Cda.) Harz. var. sorghina Sacc., stalk rot. Tex.

(Titaeospora andropogonis (Miura) Tai): Ramulispora a.

Trichothecium roseum Pers., head mold. Kans.

Tylenchus spiralis Cassidy, in roots. Hawaii.

Xanthomonas holcicola (Elliott) Starr & Burkh., bacterial streak. Ariz., Ark., Kans., Minn., Mont., Nebr., N.Mex., Okla., Tex., Va.

Chlorosis -- mineral deficiency associated with alkaline soil. Ariz., Kans., Okla., Oreg., Tex.

Mosaic -- Marmor sacchari Holmes (Saccharum virus 1 K.M.Sm.). La., Hawaii.

Weak neck -- a structural weakness associated with certain varieties. Kans., Nebr.

SORGHUM VULGARE var. SACCHARATUM (L.) Boerl., SORGHO, SWEET SORGHUM. Grown chiefly in the Southern States to Kans. and Tex., occasionally in the Central and Eastern States and Calif. Some sorgho records are included in the preceding section.

Ascochyta sorghina Sacc., leaf spot. Fla., Miss.

Colletotrichum falcatum Went, red rot. Fla., La., Miss., ? Tex., perhaps widespread.

C. graminicolum (Ces.) G.W.Wils. (C. lineola of authors), anthracnose. N.J., Tenn., Tex., Va., probably general except in South.

SORGHUM VULGARE var. SACCHARATUM cont.

Gloeocercospora sorghi D.Bain & Edg., zonate leaf spot. Fla., La.
Heterodera marioni (Cornu) Goodey, rootknot. Hawaii
Phyllosticta sorghina Sacc., leaf spot. Ark., Kans., La., Miss., Mo.
Pseudomonas andropogoni (E.F.Sm.) Stapp, bacterial stripe. Kans., Minn., probably general in the Central States.
Puccinia purpurea Cke. (II,III), leaf rust. General.
Sphacelotheca cruenta (Kuehn) Potter, loose kernel smut. Occasional in Central and Southern States.
S. reiliana (Kuehn) Clint., head smut. Calif., Kans., Minn., Utah, Va., Wis.
S. sorghi (Lk.) Clint., covered kernel smut. Calif., Colo., Ga., Iowa, Kans., Minn., Mo., Pa., Tex., Utah, Wash., Wis.
Xanthomonas holcicola (Elliott) Starr & Burkh., bacterial streak. Kans.

SORGHUM VULGARE var. SUDANENSE (Piper) Hitchc., SUDAN GRASS. Cult. for forage and hay especially in the South but also in the North Central States and the Pacific Coast

Ascochyta sorghina Sacc., leaf spot. Ga., S.Dak.
Colletotrichum graminicolum (Ces.) G.W.Wils., anthracnose. General except not reported in the Pacific Coast States.
Fusarium spp., root rot, in part secondary. N.Dak., and probably throughout the northern Plains States. These spp. identified: F. equiseti Cda., F. oxysporum Schlecht. emend. Snyder & Hansen, F. scirpi C.R.Lambert & Fautr. and its var. acuminatum (Ell. & Ev.) Wr.
Gloeocercospora sorghi D.Bain & Edg., zonate leaf spot. La., Va.
Helminthosporium sp., leaf spot. Ga., La., N.J., Tex.
H. catenarium Drechs., on blighted leaf tips. Va.
H. sativum Pam. King & Bakke, root rot. N.Dak., Va.
H. turcicum Pass., leaf blight. General. Also reported present on seed and glumes in La. and associated with root rot in N.Dak.
Phyllosticta sorghina Sacc., leaf spot. Md., Va.
Piricularia grisea (Cke.) Sacc., leaf spot. N.Dak.
Pseudomonas andropogoni (E.F.Sm.) Stapp, bacterial stripe. General in the Central States from Wis. to Miss., Tex. and N.Dak.; also Ariz., Utah, Va., Wash.
P. syringae van Hall (P. holci Kendr.) bacterial eye spot. Central States,Ind. to Tex., Kans. and N.Dak., also Ariz., Mass., N.Car.
Puccinia purpurea Cke. (II,III), leaf rust. La., Tex., Wis., Hawaii, P.R.
Pythium sp., root rot. Ga.
P. arrhenomanes Drechs., root browning. N.Dak.
P. debaryanum Hesse, root necrosis. N.Dak.
Ramulispora andropogonis Miura, leaf spot. Va.
Sclerotium bataticola Taub., charcoal rot. Tex.
Sphacelotheca cruenta (Kuehn) Potter, loose kernel smut. Tex.
S. reiliana (Kuehn) Clint., head smut. Calif., Tex., Wash.
S. sorghi (Lk.) Clint., covered kernel smut. Ariz., Calif., Iowa, Kans., Nebr., N.Car., Oreg., Wash., Wis.

SORGHUM VULGARE var. SUDANENSE cont.
(Titaeospora andropogonis (Miura) Tai): Ramulispora a.
Xanthomonas holcicola (Elliott) Starr & Burkh., bacterial streak. Kans., Mont., Va.

SORGHUM VULGARE var. TECHNICUM (Koern.) Jav., BROOMCORN. Cult. chiefly in the West Central States, especially Ill. and Okla., for the panicles used in broom manufacture.

Cephalosporium acremonium Cda., secondary root and stalk rot. Ill.
Cercospora sorghi Ell. & Ev., leaf spot. Ala.
Colletotrichum falcatum Went, red rot. Ill. Probably also in the Gulf States as the following.
C. graminicolum (Ces.) G.W.Wils. (C. lineola of authors), anthracnose, root and stalk rot. Conn. to Fla., Tex. and Ill.
Gloeocercospora sorghi D.Bain & Edg., zonate leaf spot. La.
Helminthosporium turcicum Pass., leaf blight. Ill.
Mycosphaerella holci Tehon, on leaves. Ill.
Nigrospora oryzae (Berk. & Br.) Petch, secondary root and stalk rot. Ill.
Phyllosticta sp. (? P. sorghina Sacc.), leaf spot. Ill., Mo. Associated with Mycosphaerella holci.
Pseudomonas andropogoni (E.F.Sm.) Stapp, bacterial stripe. Ark., Kans.
Puccinia purpurea Cke. (II,III), leaf rust. Ill., Kans., La.
Ramulispora andropogonis Miura, leaf spot. Okla.
Sclerotium bataticola Taub., charcoal rot. Okla.
Sphacelotheca reiliana (Kuehn) Clint., head smut. Ohio, Tex.
S. sorghi (Lk.) Clint., covered kernel smut. General.

SPARTINA (GRAMINEAE)

SPARTINA ALTERNIFLORA Lois., SMOOTH CORDGRASS (1); S. CYNOSUROIDES Lois., BIG C. (2). Robust perennials occurring in salt marshes on the Atlantic and Gulf Coasts from New England to Fla. and Tex., useful as soil binders and as food for wildlife. S. LEIANTHA Benth., CALIFORNIA C. (3), occurs in similar habitats on the California coast.

Claviceps purpurea (Fr.) Tul., ergot. Del., La., Me., Mass., Miss., N.J., N.Y. (1); Fla., N.Y. (2)
Didymella sp., on culms. La. (2)
Phyllachora serialis Ell. & Ev., tar spot. Calif. (3)
P. spartinae Orton, tar spot. Fla., Ga., Md.
Phyllosticta sp., on leaves. Md. (2)
Puccinia peridermiospora (Ell. & Tracy) Arth. (II,III), rust. Del., Fla., Miss., N.H., N.Car., Vt. (1); Del., Fla., La., Md., N.J., S.Car. (2). O and I on Fraxinus spp.
P. seymouriana Arth. (II,III), rust. Miss. (1); N.Y. (1,2). O and I on Apocynum spp., Asclepias spp., and Cephalanthus occidentalis L.
Septogloeum spartinae (Ell. & Ev.) Mr., on leaves. Calif. (3)
Septoria sp., on leaves. Md. (2)

SPARTINA ALTERNIFLORA etc. cont.

Stagonospora sp., on culms. Md. (2)

Uromyces acuminatus Arth. (II,III) rust. Conn., Del., Fla., Mass., N.J., N.Y. (1); Fla. (2). Composed of several races with distinct aecial hosts; the form occurring on the Spartina spp. in this range is designated U. a. spartinae (Farl.) Arth., with 0 and I on Moehringia lateriflora (L.) Fenz. and Spergularia spp.

U. argutus Kern (II,III), rust. Fla. (1). 0 and I unknown

SPARTINA GRACILIS Trin., ALKALI CORDGRASS (1). Perennial of alkaline meadows on the Western Plains from N.Dak. and Nebr. to Calif. and Wash. S. PECTINATA Link, PRAIRIE C. (2). Tall perennial of fresh water marshes occurring from Me. and N.Car. to Tex. and Oreg. Both spp. furnish food for wildlife.

Ascochyta spartinae Trel., leaf spot. Utah (1); S.Dak., Wis. (2). A Septoria.

Claviceps purpurea (Fr.) Tul., ergot. Mont., Okla., S. Dak. (2)

Mycosphaerella sp. (Sphaerella spartinae Ell. & Ev.), on leaves and sheaths. Nebr.

Phyllachora sp., tar spot. Minn. (2)

Puccinia distichlidis Ell. & Ev. (II,III), rust. Mont., Nebr., S. Dak., Wyo. (1); N.Y. to Okla., Colo. and Mont. (2). 0 and I on Glaux maritima L. and Steironema ciliatum (L.) Raf.

P. peridermiospora (Ell. & Tracy) Arth. (II,III), rust. Kans., Nebr., N. & S.Dak., Okla. (1); Me. to Miss., Okla. and N.Dak. (2).

P. seymouriana Arth. (II,III), rust. Mass. to Ind., Okla. and Mont. (2)

Uromyces acuminatus Arth. (II,III), rust. Mont., N.Dak., Wyo. (1); N.Y to Ind. Colo. and Mont. (2). Three races differing in aecial hosts have been identified: U. a. magnatus (Arth.) J.J. Davis with 0 and I on Convallariaceae, U. a. polemonii (Pk.) J. J.Davis with 0 and I on Polemoniaceae, and U. a. steironematis (Arth.) J.J.Davis with 0 and I on Primulaceae.

SPARTINA PATENS (Ait.) Muhl., SALTMEADOW CORDGRASS. Tall perennial occurring extensively in salt marshes along the coast from Me. to Fla. and Tex., also in saline meadows inland from N.Y. to Mich.; the principal component of salt-marsh hay used in packing and mulching, and also affords food for wildlife.

Claviceps purpurea (Fr.) Tul., ergot. Md.

Phyllachora diplocarpa Ell. & Ev., tar spot. S.Car.

Puccinia peridermiospora (Ell. & Tracy) Arth. (II,III), rust. Conn., Md., N.J., N.Y.

Tracylla spartinae (Pk.) Tassi, on culms. Miss.

Uromyces acuminatus Arth. (II,III), rust. Me., Md., Mass., N.H.

DIVISION OF MYCOLOGY AND DISEASE SURVEY

EPIPHYTOTIC OF POTATO LATE BLIGHT IN MISSOURI

T. W. Bretz

Reports were received during the week ending June 16 of a destructive blight affecting potatoes in commercial plantings in West-central Missouri. A specimen collected in that area by Dr. S. H. Wittwer, Department of Horticulture, University of Missouri, was submitted for examination, and the late blight fungus (Phytophthora infestans) was found to be sporulating profusely on the affected tissues.

Since this is the first known occurrence of late blight in Missouri, and because it had obviously attained epiphytotic proportions, Dr. C. M. Tucker of the Botany Department and the writer visited the affected area on June 19. Fields were examined in southern Ray and Clay Counties and northern Jackson County, the principal potato producing areas in western Missouri. It appeared as though the disease had developed to the greatest extent in fields located near Missouri City (Clay County), where, in some of the plantings, from 30 to 50% of the foliage had been killed and the characteristic odor that accompanies severe late blight infections was very pronounced. Near Courtney (Jackson County) the fields examined showed the disease to be prevalent throughout the stands, with numerous, well developed lesions affecting much of the foliage. In the vicinity of Orrick (Ray County), infection was found in 5 out of 9 fields visited. In 2 of these affected fields practically all of the plants showed many lesions developing. In the other stands, the disease had not yet developed extensively and only scattered plants showed visible signs of infection.

Several weeks remain until the crop matures and is harvested. It is during this period that the tubers will make their maximum growth and the damage from the disease will, therefore, be largely dependent upon the extent to which the vine growth is destroyed. Probably some loss has already occurred in the most heavily infected stands, but the total loss cannot be estimated until the crop is harvested.

Late blight is undoubtedly brought into this area each season with seed potato stock, but the weather conditions usually prevailing are such that the disease does not develop, or at least, does not become established. However, the climatological records of this year show that the optimum moisture and temperature requirements for the development of the fungus have prevailed during May and the first half of June, which undoubtedly explains the development of the current epiphytotic.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

LATE BLIGHT IN OTHER CENTRAL STATES

POTATO LATE BLIGHT IN NORTHEASTERN KENTUCKY: I have just (June 20) received specimens of late blight of potato from Lewis County on the Ohio River. This is the first time I have seen the disease on the early crop in this State. The weather has been unusually cool and rainy for this time of the year.--W. D. Valleau, Kentucky Agricultural Experiment Station.

POTATO LATE BLIGHT APPEARS IN ILLINOIS: On June 23 potato leaves affected with late blight were sent in to the Experiment Station by the farm adviser in Sangamon County (Springfield, Illinois). These were from a small planting in one corner of which the plants were said to be dying. It was apparent from the specimens that abundant sporulation had occurred. Late blight was found again on June 28 by Mr. G. H. Boewe, Field Botanist, Illinois State Natural History Survey, in trace amounts in a planting in the southern part of Green County -- approximately 45 miles north of East St. Louis, Illinois. He reports also that at least one other potato planting in the Springfield area was severely damaged by late blight. According to records of the State Natural History Survey, Green County is probably the farthest south in the State that late blight has been reported.

Almost daily rains and cool weather for the past 6 weeks or longer have created extremely favorable conditions for a severe epiphytotic of late blight. Infected tubers are known to have been planted in some sections of the State. Severe losses may occur since many of our growers are not equipped to spray or dust.

Every facility has been used to bring this serious situation to the attention of every farm adviser and potato grower in the State. Both commercial growers and home gardeners have been urged to loan what spraying or dusting equipment may be available to their neighbors so that, if late blight does develop in epiphytotic proportions, the losses may be held to a minimum.--M. B. Linn, University of Illinois, Urbana

LATE BLIGHT IN NEBRASKA: Small farm and garden plantings were examined during the week ending June 16. Late blight was found sparingly present in Gage and Lancaster Counties.

June 25 to 28 was spent in the inspection of garden plantings and commercial fields of potatoes in Gage, Lancaster, Buffalo, Dawson, and Phelps Counties. Late blight was found present in all areas visited, but only in trace amounts except in one planting near Gibbon in Buffalo County, where 100% of the plants were infected. Should favorable weather conditions for blight occur, sufficient infective material is present to cause serious losses in the Central Nebraska potato areas.--C. M. Slagg, Emergency Plant Disease Prevention Project.

DISEASES OF POTATOES IN SOUTHERN ARIZONA DURING 1945

Wm. G. Hoyman

Figures released by the Arizona Fruit and Vegetable Standardization Service indicated that the potato acreage for 1945 in the Southern Arizona counties of Yuma, Maricopa, Pinal, and Pima was 4,799. This was an increase of 1,534 acres over 1944. The certified seed for practically the entire acreage was grown in California, Colorado, Nebraska, Minnesota, and North Dakota.

During the latter part of March, potato fields were observed on the Yuma Mesa, Yuma County. This was the first year that extensive plantings (1,125 acres) had ever been made at this location. Owing to the presence of diseases and to undesirable cultural conditions, the yield was very poor. Mild and rugose mosaics (virus), Fusarium wilt (F. oxysporum),

Rhizoctonia scurf and stem rot (Corticium vagum) [Pellicularia filamentosa], purple-top wilt (virus), and psyllid yellows (insect) were present. Mild mosaic occurred in 6 plantings, but was never causing over very slight damage. Rugose mosaic, however, was causing slight loss in 220 acres. Fusarium wilt was present in several fields but of minor importance. Rhizoctonia was causing moderate loss in 220 acres. Four percent purple-top wilt was observed in a 40-acre planting of Bliss Triumph; this is the first record of this disease in the State. Damage from psyllid yellows was minor at the time the potatoes were observed. In addition to these diseases, wind injury was the cause of slight damage on the Yuma Mesa. Although commercial nitrogen-containing fertilizers were applied, nitrogen deficiency was present.

The potato growers in the Salt River Valley, Maricopa County, are generally careful to obtain good certified seed. This year, however, more than the average amount of disease was present in the out-of-state seed. In the Phoenix district, Rhizoctonia was the cause of moderate loss in 40 acres. Another grower lost 20% of this crop (40 acres) from bacterial ringrot (Corynebacterium sepedonicum). Purple-top wilt, scab (Actinomyces scabies), and Fusarium wilt were present in a few plantings but of minor importance. In the Rittenhouse district, bacterial ringrot occurred in 4 of 6 plantings surveyed. In one 35-acre field it caused a 10% loss. Purple-top wilt and scab were of minor importance.

Potato growers in the Eloy district, Pinal County, were unfortunate in obtaining White Rose seed infected with Corynebacterium sepedonicum. According to the growers, this was California-grown seed. Bacterial ringrot occurred in 10 of 11 plantings visited. Field observations indicated that the losses were very slight in 3 instances, but in the other plantings 10, 30, 50, 53, 60, 70, and 81% of the vines showed symptoms of this disease. Fusarium wilt, purple-top wilt, southern stem rot (Sclerotium rolfsii), and Rhizoctonia were uncommon and never causing over very slight loss in any instance.

In the Sahuarita district, Pima County, the Rancho Oro Verde had less loss from diseases than growers at other locations in the State. Rugose mosaic, purple-top wilt, calico (virus), southern stem rot, and Fusarium wilt were present in the 250-acre planting, but of minor importance. Calico had never been observed before in Arizona.

Since the inception of the Emergency Plant Disease Prevention Project, Arizona potato growers in the southern part of the State have not experienced much loss from diseases. The losses this year are probably more than have ever occurred in any previous year; this, of course, was due to the fact that the Eloy growers unknowingly planted certified seed infected with Corynebacterium sepedonicum. If disease-free seed were planted in Southern Arizona, the losses from diseases would generally be negligible because of the absence of the common diseases present in the more humid regions. In the past, psyllid yellows has been the only important disease where the primary infection occurred in this State.
EMERGENCY PLANT DISEASE PREVENTION PROJECT

OTHER REPORTS ON POTATO DISEASES

POTATO DISEASES IN MISSOURI: Blackleg (Erwinia carotovora) [E. phytophthora] was observed in the majority of fields examined during the

late blight survey in southern Ray and Clay Counties and northern Jackson County in Western Missouri, but in no instance was it responsible for extensive damage. An occasional plant showing symptoms suggesting rugose mosaic and a trace of early blight (Alternaria solani) were also noted.--T. W. Bretz, Emergency Plant Disease Prevention Project, week ending June 16.

POTATO DISEASES IN NEBRASKA: Small farm and garden plantings were examined during the week ending June 16. Blackleg was plentiful, as were also most of the virus diseases. Rhizoctonia and Fusarium wilts were seen. A stem rot and breakover of plants, of undetermined origin, was seen in several potato plots.

Seven potato fields in the Kearney (Kearney County) and Burwell (Garfield County) districts were examined during the week ending June 23. No late blight was found, but considerable losses from blackleg were seen in all fields, and virus diseases of several types were present. In one field in Loup County about 20% of the plants showed injuries of the blackleg type, but often the soft stem rot was not accompanied by blackening, leading to the assumption that other soft rot bacteria might also be present.

June 25 to 28 was spent in the inspection of garden plantings and commercial fields of potatoes in Gage, Lancaster, Buffalo, Dawson, and Phelps Counties.

Seed-piece rot has caused poor stands and weak plants in many fields following the cold, wet spring and the dormant condition of some seed lots. Plantings of uncut seed escaped this trouble.

Blackleg is present in amounts up to 10 to 15% in most Central Nebraska potato fields.

Virus diseases, including mild, crinkle, and rugose mosaic; calico; spindle tuber; and leaf roll were present in some fields, particularly of uncertified seed, but usually not in sufficient amounts to cause appreciable reduction in yield.--C. M. Slagg, Emergency Plant Disease Prevention Project.

PEA ROOT ROT IN NEW YORK

Robert C. Cassell

At intervals during the period from June 1 to 20, 92 pea fields involving 509.5 acres were examined in 9 counties for the presence of root rot primarily caused by Aphanomyces euteiches and Fusarium martii var. pisi [F. solani f. pisi]. Sizeable acreages of peas are raised in Western New York, where processing plants are located. Peas raised for fresh market shipment are concentrated in the valleys of Oneida, Madison, and Chenango Counties, and in the market-garden areas near the large centers of population. For the last 3 or 4 years New York has produced between 445,000 and 619,000 bushels of green peas annually for market from an area of 4,450 to 5,100 acres. Yields have ranged from an average of 95 to 125 bushels per acre. The total acreage examined in this survey represents about 1/10 of the pea acreage of the State.

The owner of each field examined was interviewed and the acreage, variety, planting date, and whether or not the seed was treated, were ascer-

tained. In all cases the seed was secured through local canneries, and the seed for 90 of the 92 fields had been treated. The approximate planting date of the 92 fields is shown in Table 1.

Table 1. Approximate planting date of 92 pea fields examined in New York 1945

Month and date	Number of fields planted
March 25-30	16
April 1-7	2
April 8-14	20
April 15-21	32
April 22-30	12
May 1-7	6
May 8-15	4

The 92 fields were selected at random throughout the 9 counties, irrespective of owner, maturity, variety, or other factors. The variety grown was determined for 88 of the 92 fields and the varieties are listed in Table 2, along with season of maturity and the acreage of each.

Table 2. Varieties grown in 92 pea fields examined in New York, 1945

Variety	Season of maturity	Number of fields	Total acreage
Surprise	Early	34	157.5
Thomas Laxton	Early	16	111.5
Wisconsin Early Sweet	Early	2	4.0
Pride	Midseason	10	44.5
Shasta	Midseason	3	14.0
Canner King	Midseason	3	12.0
Gradus	Midseason	1	10.0
Telephone	Midseason to late	4	37.0
Horsford	Midseason to late	1	4.0
Perfection	Late	11	73.0
Alderman	Late	2	8.5
Admiral	Late	1	6.0
Unknown	---	4	27.5
Total		92	509.5

In sampling a field, consideration was given to size and topography. An average of 39.4 plants was dug from each field for inspection (see Table 3). The plants were dug from 8 to 13 locations in the field, and from 3 to 5 plants were taken from each location. Care was taken to try to get a representative number of plants to correspond with area types of the field. After securing plant samples, they were taken to the edge of the field where the roots were washed free of adhering soil and the plants classified for the presence of root rot.

In classifying the plants according to whether or not they were healthy, or to the amount of root rot present, a system was used based on the one devised by the Geneva Agricultural Experiment Station in reading pea root

Table 3. Root rot of peas in fields examined in New York, 1945

County	Number fields examined	Total number plants examined	Average percent healthy plants	Average percent diseased plants: Very mild	Mild	Moderate	Severe	Dead
Tompkins	4	126	36.6	19.7	26.7	10.4	6.6	0
Ontario	11	361	51.9	20.5	12.8	8.0	6.8	0
Cortland	4	166	41.3	16.5	16.6	11.5	14.1	0
Onondaga	9	372	60.4	13.4	10.5	8.3	7.2	0
Cayuga	7	247	44.7	20.7	17.9	6.4	10.1	0
Madison	15	615	47.9	14.6	11.7	9.8	16.0	Trace
Seneca	13	456	41.5	18.0	18.0	10.6	11.9	Trace
Orleans	13	592	36.9	18.7	14.1	8.4	21.9	Trace
Genesee	16	690	37.8	13.5	14.7	13.5	20.5	Trace
Total	92	3625	--	--	--	--	--	--
Average	10.2[a]	39.4[b]	44.3[c]	17.3[d]	15.9[d]	9.7[d]	12.8[d]	Trace

a Average number of fields examined in each county
b Average number of plants examined in each field
c Average of average percent of healthy plants in each field
d Average of the average percent of diseased plants in each field

rot in experimental work. The following classification is the one used in making this survey, and is approximately the same as the one used at Geneva:

Plant healthy -- Main stem and roots clean except for an occasional brown rootlet or fleck, and a slight discoloration in the region of the seed attachment.

Plant very mildly diseased -- No Aphanomyces infection on the foot and only a slight amount on the root. Fusarium covering no more than 1/4 the circumference of the root and stem with only small streaks on the foot. (Foot considered to be the area between the seed attachment and the ground line.)

Plant mildly diseased -- Aphanomyces showing only watersoaking and slight discoloration of the foot. Cortex intact in spite of considerable browning and watersoaking of the main root and rootlets. Fusarium showing streaks on the root and foot covering 1/3 to the full circumference of the axis, but not penetrating very deeply and with no evidence of girdling.

Plant moderately diseased -- Aphanomyces showing watersoaking and discoloration of the foot with some evidence of tissue collapse. Root also showing watersoaking and tissue collapse, but to a little greater degree. Cortex of the root may be sloughed off on the lower extremities.
Fusarium browning the entire circumference of the foot with some evidence of girdling.

Plant severely diseased -- Aphanomyces on foot and root showing complete collapse of cortical tissue, but with the plant still in a turgid condition or with only very slight yellowing and wilting.
Fusarium showing complete girdling of foot and root with evidence of slight yellowing and wilting of the plant.

Plant dead -- Aphanomyces causing complete collapse of the root and foot with the top of the plant in a wilted yellow condition to the extent that plant survival would be impossible.
Fusarium completely girdling the foot and root, leaving the top of the plant in a non-recovering condition, or creating the possibility of the severance of the top from the root as a result of girdling.

The readings made of the fields were not as directly comparable as hoped for. Age and maturity of the plants from field to field varied considerably. A spread of 7 weeks occurred in the time of planting (see Table 1). Owing to prolonged wet periods and other interruptions a period of 2 1/2 weeks occurred from the date the first field was examined until the last one was finished. This caused readings to be made of fields where the plants were from 4 to 5 inches tall in almost direct comparison with fields in which the plants were in early pod.

The spring of 1945 in New York has been cold and wet, a condition favoring the root rotting organisms as well as pea growth. Most fields are quite spotted owing to water accumulation for a sufficient duration to kill out the plants in low areas. Otherwise, peas are apparently of average vigor this year.

Referring to Table 3, it will be noted that 77.5% of the 3,625 plants examined were healthy or very mildly or mildly diseased, while 22.5% were moderately or severely diseased. This is apparently not an alarming condition, as county agents have stated that they have had fewer calls this year than usual from farmers concerning root rot. The weather has undoubtedly been a big factor as there has been ample to excess moisture all spring. If hot dry conditions should prevail prior to harvest, some plants in most fields would undoubtedly fail to yield satisfactorily.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

PEA ROOT ROT AND OTHER DISEASES IN INDIANA

J. S. Tidd

Much of the Indiana canning-pea acreage surveyed earlier in the season was revisited during the 2 weeks ending June 16, in addition to fields not previously seen. Acreage in Benton, Marshall, and Fulton Counties was also inspected, Dr. A. P. Lorz of the Department of Horticulture, Purdue Experiment Station, accompanying the writer into these 3 northern counties. In all, nearly 500 acres of peas were surveyed.

The fields visited were in bloom and some nearly ready for cutting. Alaska was the principal smooth-seeded pea planted. Winner variety was also encountered. Chief, a wrinkled-seeded type, was present in one section.

In general, the stands were in excellent condition and although ripen-

ing was being delayed because of cool weather, good yields were in prospect.

As earlier reported (PDR May 22, p. 447), common root rot (Aphanomyces euteiches) and Rhizoctonia root rot (Corticium vagum) [Pellicularia filamentosa] occurred as a trace in about 25% of the fields visited in mid-May. In the present survey the 2 predominating root rots were caused by A. euteiches and Fusarium solani, traces to 1% of each being noted in nearly 50% of the fields. The 2 most severely affected plantings were only 2 acres each, these in Shelby and Marion Counties. In one, 20% of the plants were dying from Aphanomyces root rot. In the other, about 15% of the plants were dead or dying from Fusarium root rot and another 15% from Aphanomyces rot. Both fields were on poorly drained ground. Rhizoctonia root rot occurred as a trace in one field only.

The most important foliar disease was bacterial blight (Pseudomonas pisi). This disease was found in nearly 50% of the 44 fields inspected and was moderately severe in 5 of these, stems, leaves and pods having lesions in abundance on 25 to 50% of the plants. In Central Indiana, where aphids were becoming prevalent, streak (virus) was found in several fields but only in trace amounts. Other leaf diseases such as Ascochyta blight and anthracnose, and near-wilt were not identified. Fields in which freezing injury was present in May were not visited again.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

DISEASES OF LETTUCE AND OTHER VEGETABLES OBSERVED IN NORTHERN NEW JERSEY

A. J. Mix

Report of Eleventh Visit to Northern New Jersey Vegetable Growers, June 6 to 8. Lettuce harvest had been completed at 4 farms (Farm 3, 11, 12, 13). Romaine lettuce was still being harvested at 3 farms (2, 9, 15), and Boston lettuce at one farm, Farm 16, with loss from drop (Sclerotinia sclerotiorum) of from 5 to 15%. On the remaining lettuce-growing farms Iceberg lettuce was being harvested or was nearly ready for harvest, and in most fields the loss from drop (S. sclerotiorum) amounted to from 5 to 10%. In a few younger fields, not yet heading, the disease had not appeared. At Farm 18 2 fields of Iceberg lettuce, one ready for harvest and one already cut, had remained free from drop, although both S. sclerotiorum and S. minor have caused considerable loss in all other fields on this farm. The grower was inclined to attach significance to the fact that plants for these 2 fields had been grown in frames without the use of mats. Mats are used during winter to cover frames at night, and on cloudy, rainy, or snowy days are left on through the day.

Gray mold (Botrytis sp.) of lettuce was still evident in slight amount on 2 farms (Farm 2 and 20).

On 2 muck farms (13, 14) devoted to celery, a small crop of Boston lettuce had been grown. This was being harvested at the time visited. Loss due to drop (S. minor) amounted to about 5%.

A good crop of cauliflower has been secured, entirely free from disease.

No disease, except a trace of leaf spot of beets (Cercospora beticola), has been observed so far in field-grown crops: spinach, celery, radishes, kohl-rabi, Swiss chard, etc. Peppers and tomatoes which have been trans-

planted to fields fairly recently are still healthy.

Report of Twelfth Visit to Northern New Jersey Vegetable Growers, June 20 to 22. Late Iceberg lettuce (varieties Great Lakes and "456") was grown this season on 11 of the 20 farms (Farm 1, 3, 4, 5, 7, 9, 13, 14, 16, 19, 20). Fields that were ready for harvest or nearly so showed a considerable amount of bacterial soft rot (apparently Erwinia carotovora). In some cases this appeared to have followed tip burn, but in others, notably in a field of the Great Lakes variety at Farm 7, the soft rot was primary. Heads were fully mature if not slightly over-mature. Small yellow soft-rotted areas occurred on the midrib, veins, or blade of several leaves near the outside of the head. These spots showed (examination by Dr. C. M. Haenseler) abundant bacteria suggesting the soft-rot organism. Later stages of this type as well as of the type following tip burn showed soft slimy rot with nearly complete destruction of the head. The weather had been both hot and wet and apparently very favorable to soft rot.

Younger fields (not yet close to heading) of these 2 varieties showed no disease. These fields occur on the Farms 1, 3, 4, 7, 20.

Following the recent hot weather gray mold (Botrytis sp.) of lettuce, and lettuce drop (S. sclerotiorum and S. minor) had completely disappeared from all fields. Not a single specimen of either disease was found. On 2 farms (3 and 4) celery has been planted in fields where lettuce drop (S. sclerotiorum) had been severe.

A disease of lettuce of undetermined cause has recently been found by Dr. Haenseler on several New Jersey vegetable farms. What is apparently the same trouble was seen by the writer at Farm 19 on May 11, only a few plants in one field being affected. On May 24 it was affecting somewhat less than 1% of the plants in this and in another field, and on June 8 it was present in about the same amount. On June 21 it was found in larger amounts in fields of the Great Lakes and "456" varieties on 5 farms (5, 13, 16, 19, 20). One of these (Farm 13) is a muck farm.

The disease may best be described as "wilt". Plants form heads, though they may remain smaller than usual. Wilting occurs, especially in the outer leaves, and some of the outer leaves die. Yellow (or brown) discoloration is present in the central portion of the main root, and yellowing may extend up the vascular ring. In the plants collected on May 11, a fungus was found present in the vessels of the root. Cultures were attempted without result. Dr. Haenseler has obtained a Pythium-like fungus in cultures from some of the diseased plants that he has collected.

Among the plants collected on June 21 a number that showed wilting and were thought to be diseased did not show any internal discoloration of any part of the root system. These plants were indistinguishable in the field from others that showed the usual discoloration.

Cauliflower harvest had been completed on the date of this visit and cabbage was being harvested. Two cabbage plants were found on Farm 4 and one plant on Farm 9 that were affected by black rot (Xanthomonas campestris) followed by bacterial soft rot.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

REPORTS ON TOBACCO DOWNY MILDEW

PENNSYLVANIA: Downy mildew (Peronospora tabacina) was seen in a bed in Lancaster County. Only a trace was present.--Robert C. Cassell, Emergency Plant Disease Prevention Project. May 22-26.

OHIO: The writer was accompanied by Warren C. Jacobs, Assistant Extension Pathologist, Ohio State University, during a survey in Southwestern Ohio.

Tobacco seedbeds in Southern Ohio were severely damaged by blue mold [downy mildew]. The first infections were noticed in Brown County on June 1. Infection spread rapidly and by June 8 the disease was developing in epiphytotic proportions in the cigar filler area (Montgomery, Darke, Miami, and Preble Counties). Dr. C. C. Allison reports that in the burley area (Adams, Brown, Clermont, and Hamilton Counties) from 10 to 40% of the plants in seedbeds examined on June 7 to 8 were killed. However, by exchanging plants the burley growers expected to have enough plants to set most of their acreage. In the cigar filler area damage was considerably greater, the stand in most beds being reduced by 50 to 80%. It is estimated that in the cigar filler area there will be only enough plants available to set about 50% of the acreage prepared for tobacco.

In most of the beds the disease has run its course and very few active lesions could be found on June 20 and 21. The majority of the growers have hastened recovery of their remaining plants by applying nitrate of soda. Some plants were being set but most fields are still too wet as a result of the heavy rainfall and excessive cloudy weather that has prevailed during the past 2 weeks.

Ordinarily downy mildew is not serious in Ohio. Cool, cloudy weather during the early part of June caused the disease to more destructive this season than ever before. The only previous outbreak of importance in Ohio occurred in 1938 when similar weather conditions prevailed. Because of the insignificance of downy mildew injury during the past 6 years most tobacco growers have discontinued the application of preventive measures. Consequently, although the growers in the filler area were notified a day or two in advance of the developing epidemic, most of them were not prepared to fumigate with paradichlorobenzene and had not applied the necessary early preventive sprays.

Practically 100% control was obtained in 2 beds at the Germantown Experiment Station by paradichlorobenzene fumigation started immediately after the first infection was noted. One grower, near Gordon, had prevented infection up to June 21 by applying red cooper oxide S.E.C. sprays twice a week. However, on June 21 new infections were apparent on most of the plants. The dense stand, making thorough coverage impossible, and the heavy rainfall immediately following the last spray application (before the leaves had dried) were undoubtedly jointly responsible for the failure to obtain continued control. The plants in these beds had attained sufficient size that little material loss is expected.--Alvin J. Braun, Emergency Plant Disease Prevention Project. June 18-23

FUNGI ISOLATED FROM MOLDY SWEET CHERRIES IN THE PACIFIC NORTHWEST

Harley English

During the summer of 1940 isolations from decaying sweet cherries that had been held under conditions simulating those encountered during commercial transportation and marketing yielded predominantly a species of Pullularia. The fruit for this test was obtained from a single orchard near Dryden, Washington, and the question immediately arose as to the importance of Pullularia rot throughout the commercial sweet cherry producing districts of the Pacific Northwest. Another problem that demanded attention was the incidence of brown rot in sweet cherries in this same general region. Not infrequently fruit inspection reports at eastern terminals have indicated the presence of brown rot in sweet cherries from localities in Washington and Oregon where this disease is not known to occur. In an attempt to answer these questions numerous isolations were made from decaying sweet cherries collected from the more important districts during the period from 1941 to 1943, and additional specimens from some of the districts were examined in 1944.

The fruit used during 1941 was collected from 2 packing plants at Wenatchee, Washington, and each lot of approximately 20 lbs. represented a composite of Bing cherries from at least 10 orchards in the Wenatchee Valley. In 1942 a composite sample of Lambert cherries from the Wenatchee Heights section was selected. The 1941 fruit showed moderate rain damage, but that used in 1942 had very little injury of this type. In both seasons the fruit was sorted so as to be comparable with commercially packed cherries, and examinations for decay were not made until after a simulated transit and marketing period.

Most of the fruit collected in 1943 represented mixed varieties obtained from numerous grower-lots in various packing houses in the Northwest. Culls were not discarded, and in fact some samples were procured from the cull barrels. In a few of the localities visited, picking had not commenced, and samples with or without decay were removed directly from the trees. Isolations were made immediately from fruit showing decay, but cherries that appeared to be uninfected were stored at 45° F and examined for rot after 10 to 14 days. Subsurface isolations were made from cherries with definite decay lesions, but surface tissue was used in instances where the fungus had invaded only the exposed layers of the ruptured flesh.

Incidence of Different Rot Fungi

In Table 1 the geographic distribution and frequency of occurrence of the fungi isolated from moldy sweet cherries are presented. The isolates, with the exception of the 2 species of Sclerotinia, are listed only by genus. Pullularia was found to be widespread in the Pacific Northwest and to occur approximately twice as frequently as Alternaria, the next most common genus. The only districts where Pullularia was not obtained were Lewiston, Idaho, and Hood River, Oregon. In both of these localities the cherries were immature when examined, and the few samples collected were picked from the trees. There is little doubt that Pullularia would have been found had mature fruit been available. In the Clarkston,

Table 1. The fungi isolated from moldy sweet cherries collected from the more important producing districts of the Pacific Northwest. (Table concluded on opposite page)

Source and variety of fruit					Number of isolations of			
District	Locality	Year	Collected from	Variety	Total isolations made	Alternaria	Aspergillus	Botrytis	Cladosporium
Lewiston, Idaho	Lewiston Heights	1943	Tree	Mixed	10	0	0	0	0
Hood River, Oregon	Experiment station	1943	Tree	Mixed	21	0	0	0	0
	Galligan orchard	1943	Tree	Mixed	8	0	0	0	0
Freewater, Oregon	General	1943	Warehouse	Mixed	205	78	0	43	14
	Miller								
The Dalles, Oregon	orchard	1943	Tree	Mixed	7	0	0	2	0
	General	1943	Warehouse	Bing	51	9	0	8	5
Clarkston, Washington	General	1943	Tree	Mixed	58	31	0	11	0
Dryden, Washington	Single orchard	1940	Warehouse	Bing	124	23	0	0	24
Silcott, Washington	Fisher orchard	1943	Tree	Mixed	109	33	0	52	1
Wawawai, Washington	General	1943	Warehouse	Bing	69	12	1	10	0
Wenatchee, Washington	General	1941	Warehouse	Bing	287	33	0	17	85
	Heights	1942	Warehouse	Lambert	60	4	0	7	25
	General	1943	Tree	Mixed	12	0	0	0	0
Yakima, Washington	Upper valley	1943	Warehouse	Bing	44	6	0	0	15
	Lower valley	1943	Warehouse	Mixed	112	32	0	12	32
	General	1943	Warehouse	Mixed	105	26	0	11	15
Totals	---	--	---	Mixed	1282	287	1	173	216

Table 1 conc.

Source	Number of isolations of													
District	Coryneum	Cytospora	Fusarium	Lambertella	Mucor	Penicillium	Pleospora	Pullularia	Rhizopus	Sclerotinia fructigena	Sclerotinia laxa	Stemphylium	Unidentified forms	Cladosporium
Lewiston, Idaho	1	0	0	0	0	0	0	0	0	0	9	0	0	0
Hood River, Oregon	0	0	0	0	0	0	0	0	0	18	3	0	0	0
	0	0	0	0	0	0	0	0	0	5	4	0	0	0
Freewater, Oregon	4	4	0	1	2	17	0	62	5	0	0	2	4	14
The Dalles, Oregon	0	0	0	0	0	0	0	5	0	0	0	0	0	0
	0	0	0	0	0	11	1	17	1	0	6	2	3	5
Clarkston, Washington	0	0	0	0	0	1	0	14	0	0	9	0	0	0
Dryden, Washington	0	0	0	0	0	3	0	76	0	0	0	3	1	24
Silcott, Washington	0	0	0	0	0	3	0	42	0	0	0	2	1	1
Wawawai, Washington	0	4	0	0	0	12	0	25	3	0	1	0	3	0
Wenatchee, Washington	0	0	1	0	0	9	5	207	0	0	0	8	0	85
	0	0	0	0	0	2	0	21	1	0	0	2	2	25
	0	0	0	0	0	0	0	12	0	0	0	1	0	0
Yakima, Washington	0	0	0	0	0	5	1	32	0	0	0	3	0	15
	0	1	1	0	1	14	3	41	1	0	0	3	1	32
	0	1	1	0	0	34	2	40	0	0	0	2	0	15
Totals	5	10	3	1	3	111	12	594	11	23	32	28	15	16

Washington, and Freewater, Oregon, districts Alternaria was the most common genus, and it was important in all other localities where mature fruit was collected. Cladosporium and Botrytis ranked third and fourth, respectively, in frequency of occurrence, and both genera appear to be widely distributed on sweet cherries in the Pacific Northwest. Penicillium placed fifth, although it too was found in all of the districts in which mature fruit was examined.

Of the 2 species of Sclerotinia causing brown rot, S. laxa appeared to have the wider distribution, although additional study would be necessary to establish this fact definitely. It was found at Hood River and The Dalles, Oregon; Lewiston, Idaho; and Clarkston and Wawawai, Washington, whereas S. fructicola was obtained only at Hood River. Brown rot was not found at Freewater, Oregon, although its presence there had been suspected previously, nor did it appear in several hundred isolations from moldy cherries collected in the Yakima and Wenatchee districts of Washington.

Although Rhizopus was encountered only rarely, fruit inspection reports at eastern markets indicate that members of this genus occasionally are responsible for severe losses in shipments of sweet cherries from the Pacific Northwest. The probable explanation for this apparent discrepancy lies in the fact that Rhizopus nigricans, the species presumably responsible for most of the decay, is a high-temperature fungus and when fruit is shipped without proper refrigeration this mold can spread rapidly throughout a box of cherries from relatively few initial infections.

The other genera listed in Table 1 appear to occur too infrequently to cause serious decay losses in sweet cherries from this region.

Mode of Infection

The greatest hazard in the production of sweet cherries in the Pacific Northwest is rainfall occurring as the fruit is approaching maturity. Depending on the duration and intensity of the rain from few to nearly 100% of the fruit may be cracked as a result of the absorption of water through the skin. The injury usually consists of easily discernible collar and longitudinal cracks of variable size and depth, and minute, more or less concentric cracks, usually at the stylar end, which penetrate only through the cuticle or the epidermis[1]. This latter type of injury is frequently referred to as "rain scald" and the actual fissures through the protective layers of the fruit can be clearly seen only with the aid of a hand lens or microscope. Both types of ruptures may lead to serious fungous infection, especially if weather conditions immediately following the injury are not conducive to desiccation and healing of the exposed tissue.

The data in Table 2 show the importance of rain damage in the initiation of decay in the fruit studied in 1943. Approximately 3/4 of the infection in these cherries, collected from nearly all of the important producing districts of the Pacific Northwest, was through cracks caused by rain. This type of injury was again serious during the 1944 season when certain collections of fruit, comparable to some lots being commercially packed, developed nearly 50% decay during a simulated transit and

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[1] Verner, Leif, and E. C. Blodgett. Physiological studies of the cracking of sweet cherries. Idaho Agr. Exp. Sta. Bull. 184. 15 pp. illus. 1931

Table 2. Mode of infection of sweet cherries by the fungi isolated in 1943. Fruit severely damaged by rain

Fungus	Total infections	Number of infections through: Rain injuries	Punctures	Pulled-stem openings	Attached unfertilized fruit	Apparently uninjured skin	Unidentifiable points
Alternaria	227	186	28	1	1	3	8
Aspergillus	1	1	0	0	0	0	0
Botrytis	149	76	38	4	1	13	17
Cladosporium	82	57	11	4	0	4	6
Coryneum	5	2	0	0	0	1	2
Cytospora	10	6	0	0	0	0	4
Fusarium	2	1	0	0	0	0	1
Lambertella	1	0	1	0	0	0	0
Mucor	3	1	0	0	0	0	2
Penicillium	97	62	15	2	0	4	14
Pleospora	7	4	2	0	0	0	1
Pullularia	290	252	20	3	2	6	7
Rhizopus	10	2	2	0	0	0	6
Sclerotinia fructicola	23	0	0	0	3	9	11
Sclerotinia laxa	32	9	1	0	2	6	14
Stemphylium	15	10	4	0	0	0	1
Unidentified forms	12	11	1	0	0	0	0
All forms	966	680	123	14	9	46	94

marketing period. In a season like that of 1943 punctures resulting from the feeding of birds and from picking and other handling operations are of relatively minor importance in predisposing the fruit to infection.

The cherries collected in 1942 showed very little rain damage, and punctures accounted for approximately 2/3 of the decay. Openings left by the accidental removal of stems were next in importance as courts of infection. The total decay in this fruit, following a simulated transit and marketing period, was only 3.8%, whereas in 1941 with cherries that showed moderate rain injury the percentages of rot ranged from 10.2 to 22.1%. It appears that in seasons when rain damage does not occur, it should be possible by following proper handling practices to market sweet cherries from the Pacific Northwest without excessive losses attributable to decay. The disturbing fact is that during nearly every year rains cause sufficient injury to markedly affect the keeping quality of at least a portion of the fruit.

Further Notes on Some of the Rots

Pullularia Rot. Several culturally distinct forms of Pullularia (Dematium) have been isolated but the specific identity of these isolates has not yet been determined. These fungi appear to be the most common invaders of rain-damaged sweet cherries in the Pacific Northwest. Inoculation studies with some of these isolates have established the fact that they are weakly pathogenic. They develop slowly in inoculated sweet cherries and their ability to cause decay appears to be greatly influenced by fruit maturity. Although the data in Tables 2 and 3 suggest that the Pullularia isolates are able to invade uninjured cherries,

Table 3. Mode of infection of sweet cherries by the fungi isolated in 1942. Fruit only slightly damaged by rain.

Fungus	Total infections	Number of infections through: Rain injuries	Punctures	Pulled-stem openings	Apparently uninjured skin
Alternaria	4	0	4	0	0
Botrytis	7	2	3	1	1
Cladosporium	25	2	17	6	0
Penicillium	2	0	2	0	0
Pullularia	21	3	13	4	1
Rhizopus	1	0	1	0	0
Stemphylium	2	0	2	0	0
Unidentified forms	5	0	2	0	3
All forms	67	7	44	11	5

inoculations with spore suspensions have failed to result in infection. The rots usually are small, somewhat depressed, brown, and under conditions of high relative humidity, such as are encountered in a cold storage room or refrigerator car, the surface of the lesions generally becomes more or less sticky and the skin extremely soft. Pullularia spores abound in this sticky matrix and in the partly disintegrated host tissue. Minute subepidermal stromata, which eventually become erumpent, sometimes are evident, giving the lesions a rather pebbled appearance.

Pullularia rot forms no aerial mycelium, nor does it appear to spread from one fruit to another by contact. The decayed tissue does not become watery and drip from the packages, as frequently occurs with Rhizopus rot and sometimes with blue-mold decay. Probably because of its inconspicuous nature this rot heretofore has attracted very little attention. Although Pullularia was obtained in pure culture from most of the isolations, it not infrequently was isolated in conjunction with one or more of the other fungi listed in Table 1.

Brown Rot. As previously mentioned, both Sclerotinia fructicola and S. laxa were found in decaying cherries at Hood River, Oregon, but only the latter species was obtained from the other districts where brown rot was detected. At Lewiston, Idaho, and Hood River, cherry orchards were visited about 10 days prior to harvest, and all of the infection observed in the maturing fruit originated from contact with completely rotted and presumably unfertilized cherries that had failed to drop at the usual time. In some clusters contact infection was found in 2 or 3 fruits, and by harvest time considerable additional spread undoubtedly would have occurred. At Clarkston, Washington, the cherries were almost ripe and most of the brown rot observed centered at injuries caused by rain.

Although only one brown rot infection was encountered in fruit from Wawawai, Washington, reliable reports indicate that this decay is common there during some seasons. It is difficult to understand why brown rot does not occur in the Freewater district of Oregon as the climate there is very similar to that in the Lewiston-Clarkston area where the disease has been fairly common during recent years. Two hundred and five isolations and numerous other examinations in 1943 failed to reveal the presence of brown rot at Freewater, and additional samples collected in 1944 also exhibited none of this decay.

Kienholz[2] has presented data which suggest that the Hood River district is entering a 40- to 50-year period of increasing rainfall. Precipitation records indicate a similar trend in the important cherry-producing districts in Central and Eastern Washington. With the recent increase in spring and summer precipitation in the Wenatchee and Yakima areas, it was feared that brown rot, which has not been known to occur in these locations, might become established. Results to date, however, indicate that this destructive rot is still absent.

Lambertella Rot. In 1943 Whetzel[3] described Lambertella pruni, a species first found on mummified sweet cherry fruits in Western Oregon and more recently collected on mummies of apricot and prune in California[4]. In the present study a species of Lambertella was obtained from a decaying sweet cherry found at Freewater, Oregon, in June 1943. The isolate is definitely not L. pruni but it does show a striking similarity to the tropical species L. jasmini, known only from Bermuda. Whether the 2 fungi represent distinct species or whether the recent isolate from Oregon should be regarded as a variety of L. jasmini only further study can reveal.

Miscellaneous Rots. The specific identity of most of the isolates has not been definitely established but tentative identifications of the fungi associated with some of the rots have been made as follows:

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2 Kienholz, J. R. Weather cycles and fruit diseases at Hood River, Oregon. Plant Disease Reporter 27: 77-82. 1943

3 Whetzel, H. H. A monograph of Lambertella, a genus of brown-spored inoperculate Discomycetes. Lloydia 6: 18-52. illus. 1943

4 Yarwood, C. E. Apricot diseases in the Santa Clara Valley in 1943. Plant Disease Reporter 28: 32-33. 1944

Alternaria rot -- Alternaria mali and one or more other forms have been recognized.

Aspergillus rot -- Aspergillus niger.

Gray-mold rot -- most of the isolates appear to be of the Botrytis cinerea type.

Cladosporium rot -- Cladosporium herbarum, a species of the Hormodendrum cladosporioides type, and 2 other forms.

Coryneum rot -- Coryneum carpophilum.

Blue-mold rot -- Penicillium expansum and several unidentified forms.

Rhizopus rot -- R. nigricans and one unidentified species isolated.

Further studies on the taxonomy and pathogenicity of the isolates are in progress.

DIVISION OF FRUIT AND VEGETABLE CROPS AND DISEASES, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, U.S. DEPARTMENT OF AGRICULTURE, WENATCHEE, WASHINGTON

FIRE BLIGHT ON PEARS IN NORTHERN AND CENTRAL CALIFORNIA

Henry Schneider

During the last 2 weeks of May, most of the more important pear-growing districts of Northern and Central California were visited. The results of observations on fire blight (Erwinia amylovora) are summarized in Table 1.

Eldorado and Yuba Counties were visited with Dr. H. Earl Thomas of the University of California, and F. C. Reimer of the Southern Oregon Branch Experiment Station, who were interested in determining the value of copper sprays and dusts in preventing blight infections. Effective control apparently depended upon getting copper into all of the blossoms just before a period of damp or rainy weather.

In Eldorado County many growers apply 1 or 2 sprays of weak bordeaux during the blossom period. In one orchard where spraying was discontinued because of rain, trees in a row sprayed just before a rain had 8, 15, 17, and 17 infections per tree. Trees in the next row sprayed 3 days later but after the rain had 50, 53, 52, infections per tree, and a tree 2 rows over, away from the spray drift, had 82 infections.

Another orchard had been subdivided. One of the new owners sprayed with bordeaux, while the other did not. Spraying from one side of the rows was started when a third of the Bartlett and half of the Bosc flowers were open, and the trees were sprayed from the opposite side 3 days later. Two Bosc trees on the border row of the sprayed orchard had 4 and 0 infections per tree. Bosc trees in the adjacent row in the unsprayed orchard had 66 and 252 infections. Similarly, a Bartlett tree had 6 infections in a sprayed row, while another in the adjacent unsprayed row had 199.

All of the pears seen in Yuba County were owned by one company, which has frequently had severe blight trouble for many years. During the past 2 years copper-lime dust has been applied every few days during the blossom period. Last year a portion of the orchard was left undusted, and tremendous differences in blight infections are said by reliable sources to have occurred between the dusted and non-dusted portions of

Table 1. Occurrence of fire blight on pears in Northern and Central California

County	Severity[a]	Distribution	Remarks
Eldorado	Very severe	General below Placerville	
Yuba	Trace[b]	Local	
Placer	Slight	Local	
Lake	Slight	General	
Mendocino	Slight	General	Moderate to severe in several scattered orchards
Napa	Slight	Local	Severe locally on some apple varieties
Sonoma	--	--	Severe in scattered apple orchards near Sebastopol
Santa Clara	None observed		
Sacramento River delta	Trace[c]	General	
Contra Costa	Slight to moderate	Local	

[a] Terminology indicates approximately: Trace -- occasional trees with one or a few infected spurs. Slight -- 1 to 5 infected spurs on most trees (usually late blossom infections). Moderate -- 5 to 10 infected spurs on most trees. Severe -- More than 10 infected spurs per tree (infection through main crop of blossoms).

[b] Apparently blight was controlled by dusting. See text.

[c] From an observation on May 4

the orchard. Evidence of severe cutting is still visible in the undusted area. No checks were left this year but one block of about 500 acres was almost entirely free from blight, and another orchard of about 400 acres had only a trace of blight in a portion of the orchard. The nearest non-treated orchard was about 11 miles away and it was moderately affected.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

"BROWN BERRY" OR MILD STREAK ON RASPBERRY IN PENNSYLVANIA

George L. Zundel

In 1941, I reported in the Plant Disease Reporter the occurrence of what I termed "brown berry disease". This disease had destroyed a large part of a Cumberland raspberry crop of one field in Lawrence County. I also found this disease very prevalent in the Cumberland and Plum Farmer varieties on another farm in Butler County (PDR 25: 87-91. Feb. 15, 1941). That same year, another member of our Extension Pathology Department reported this disease in Venango County.

The brown berry symptoms appear just as the fruit is ripening, turning the partially ripened fruits brown in color and causing them to adhere

very firmly to the vine. Many guesses and suggestions were given as to the cause. Some thought it was the lack of pollination and others attributed it to too much rain, and still others to drought.

Two years ago, another patch of the Cumberland variety of raspberry was reported to the County Agent in Butler County, and the next season Mr. J. B. Demaree of the Bureau of Plant Industry, Soils, and Agricultural Engineering, U.S. Department of Agriculture, and I visited this patch. Besides the brown berry trouble, we also found plenty of mild streak. I identified certain plants as having brown berry disease, and Mr. Demaree identified some of the same plants as having mild streak. Tips were placed in the ground last fall and this spring they were sent to Mr. Demaree at Beltsville, Maryland. He found that every one of the plants had mild streak.

This last week Mr. Demaree and I made a trip in the western boundary region of Pennsylvania and we are agreed, I think, that the brown berry disease is a symptom of what has previously been called mild streak. Briefly, the symptoms are these:

The mild streak causes no reduction in growth of the young canes, so that they appear normal, but one will find that the leaves of these plants are hooked downward at the tips. In cases of severe infection, the leaves are more or less rolled downward. To the ordinary observer, such plants appear to be normal in vigor, but in most cases, there is a streaking on the stem. These streaks are rather narrow, short, and have a water-soaked or light grayish appearance. They seem to be intensified as the plant gets older, and are most pronounced on such varieties as Morrison and Logan. They are also present on our new Pennsylvania variety known as the "Early Butler". Contrasted to these vigorously growing young canes, the berries become seedy looking and are brown. The plant producing berries has more or less of a yellowish appearance.

In Lawrence County we found patches infected 100% with the brown berry-mild streak disease. We also found it attacking the Columbian purple cane raspberry and 2 or 3 plants of the red variety. We also found a patch in Butler County where 100% of the old plants were infected with this trouble, and all of the new plants taken from the old planting also exhibited the streak symptoms. The disease was also found in western Erie County, but was less prevalent in the eastern part. One nursery in Harbor Creek, Erie County, was found to have plants that were apparently free from the brown berry-mild streak disease. As I said before, we feel now that the brown berry condition is just another symptom of mild streak. By the way it appears, the term "mild streak" is very inappropriate for this disease. Brown berry or seedy disease would be more appropriate.

Yesterday (June 28) we were called to the raspberry fields of York County. No mild streak or other virus diseases were observed. However, the crop is practically a failure. Examination of the fields showed that there is a very heavy infection of anthracnose [Elsinoë veneta]. Spraying has not been a standard practice in this area. In one field, at least 90% of the raspberries were rendered unmarketable. In another patch, we estimated that 70% of the crop was ruined. In a third patch where some spraying had previously been practiced, the anthracnose was cut down to possibly 10 or 15%.

PENNSYLVANIA STATE COLLEGE

DISEASES REPORTED ON STRAWBERRY

RED-STELE DISEASE OF STRAWBERRY IN MAINE: The first known instance of red-stele disease (Phytophthora fragariae) in Maine was identified by J. B. Demaree in 1944 (letter to D. Folsom). The disease had been found in a single strawberry planting in Southwestern Maine almost on the New Hampshire border. Several infected strawberry plantings have been found in the spring of 1945, scattered throughout the central and southwestern part of Maine, with one report from a locality on the coast line. The cool, wet weather this spring has probably favored the appearance of the disease.--M. T. Hilborn, Agricultural Experiment Station, Orono.

STRAWBERRY DISEASES IN MISSOURI: The most prevalent trouble observed in the harvested berries as they were arriving at the loading platforms was the presence of dead "caps" (sepals), and according to the Federal-State marketing inspector this is the major problem in the area affecting the production of quality fruit. There was no indication of the nature of the causal factor responsible for this condition. The only berry rot observed was leather rot (Phytophthora cactorum), and in the lots of fruit examined, this disease was causing only a trace of damage. However, according to the marketing inspector, the prevalence of leather rot varied from day to day, depending upon weather conditons, and it has affected as high as 25% of the berries in a few lots, with 5% not being uncommon.

In the field planting examined on the University of Missouri Experimental Farm, the beds appeared to be deteriorating rather rapidly. Much dead foliage was in evidence and many partially developed berries were withering as a result of the death of the fruit pedicels. The prevalence of dead sepals was also pronounced. Although leaf spot (Mycosphaerella fragariae) and scorch (Diplocarpon earliana) were present to a limited extent on the foliage, these diseases did not appear to be sufficiently damaging to account for the deterioration of the plants. A few plants in the most advanced stages of withering were removed for an examination of their root symstems. These showed relatively few roots that appeared to be functional, with many of the roots showing the cortical tissues in advanced stages of decay and easily removable from around the stele. It seems probable that a disease complex, aggravated perhaps by the unfavorable weather conditions which have prevailed this season, may account for the general reduction in the vigor of the plantings observed. --T. W. Bretz, Emergency Plant Disease Prevention Project. Week ending June 2.

PYTHIUM APHANIDERMATUM ON ARIZONA FLAX IN THE SALT RIVER VALLEY

Wm. G. Hoyman

During January, 1945, experimental flax plantings of Dr. Arthur T. Bartel, Assistant Agronomist, U.S. Department of Agriculture, were observed on the University of Arizona Farm, Mesa, Arizona. According to Dr. Bartel, the 9 varieties were seeded October 23, 1944. Observations in-

dicated that plants of each variety had died during the seedling stage. Those surviving were quite conspicuous because of their yellowish foliage and nonvigorous appearance. An examination of the root systems of affected plants indicated symptoms of general necrosis. Several isolations were made from diseased roots and a species of Pythium was generally obtained. Fusarium sp. appeared less frequently. In an adjoining plot seeded December 5, 1944, belonging to the University, many seedlings were dying when observed in January. A species of Pythium was repeatedly isolated from affected roots.

Soil from the flax nursery was used for conducting pathogenicity tests with these fungi. Seed of Argentine (pale blue), Bison x Abyssinia, Calar, Indian Type, Ottawa x Bison (C.I. 1036), Ottawa x Bison (C.I. 1040), Punjab, Viking, and 2558-2-C (Canada), were obtained from Dr. Bartel. These were seeded in 10-inch pots containing steamed soil that had been infested with a recent isolate of the Pythium. All varieties proved susceptible. Only the variety Punjab was seeded in steamed soil containing the Fusarium isolate; this organism proved to be a secondary invader.

Cultures of the pathogen were identified by Dr. W. W. Ray, of the Emergency Plant Disease Prevention Project, Stillwater, Oklahoma, and Dr. John T. Middleton, of the Citrus Experiment Station, Riverside, California, as Pythium aphanidermatum. This species was previously reported on cucurbits in Arizona by Gottlieb and Butler[1]. Diddens[2], while working on flax scorch caused by P. megalacanthum, tested several species of Pythium including P. aphanidermatum for pathogenicity on flax, and states that P. aphanidermatum caused little or no decay of the roots. However, this species was pathogenic on the varieties tested in the present instance, and this constitutes the second report of a member of this genus parasitizing a crop in Arizona.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

TWO IMPORTANT FLAX DISEASES IN CALIFORNIA IN 1945

Byron R. Houston

Fusarium Wilt (Fusarium lini Bolley) was isolated for the first time in this State from diseased flax specimens sent to this station in March 1945, by Mr. L. G. Goar of the College of Agriculture Agronomy Field Station located at El Centro. The plants were from fields in the Imperial Valley, which at that time were approximately a month from maturity. Other specimens were obtained from scattered spots in fields in that area, indicating that the disease has become established in a number of places. All infections seen this year were on old plants, at least in early bud stage, which indicated that the infections took place in early spring after temperatures had risen to a point where the fungus became active. The plants showed typical symptoms of late-season infection. The causal

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[1]Gottlieb, Manfred, and Karl D. Butler. Pythium root rot of cucurbits. Phytopath. 29: 624-628. 1939

[2]Diddens, Harmanna A. Onderzoekingen over den vlasbrand, veroorzaakt door Pythium megalacanthum de Bary. (Investigations on flax scorch caused by Pythium megalacanthum de Bary.) Thesis, Univ. of Amsterdam, 1931. (Abst. Rev. Appl. Myc. 10: 731-733. 1931).

organism was isolated consistently from stem and root tissues. When soil was inoculated with cultures of the fungus and planted to flax of the varieties Punjab C.I. 20, and Argentine (Calar) C.I. 463, all seedlings of Punjab were killed within 10 days, and all those of Argentine within a month, after emergence. Argentine appears to have a slightly higher degree of resistance than does Punjab.

Curly Top (virus) of flax was first found in commercial fields in California in March 1944 (PDR 28: 507, 1944), with the percentage of infection varying from 1 to 5. Loss during that season was not appreciable in most fields.

In March 1945, a survey of the flax-producing area of Central California revealed a severe curly-top epiphytotic in the early-planted fields. Infection in the most severely affected plantings approximated 40%, with an estimated average of 8 to 10% for the whole area. Many of the later plantings had less than 1% curly top. The earlier fields were affected more because they were in the seedling stage in late October and early November when the leafhopper vector, Eutettix tenellus (Baker), began its fall migration from the valley to the foothill region west of the flax-producing area.

Table 1. The varietal reaction of 19 flax varieties to the curly-top virus under field conditions in California

Percent infection			
80-95	65-80	50-65	20-35
Argentine	C.I. 828	Rio x Roman	C.I. 1009
Calar Foundation	C.I. 976	Winter-5	
C.I. 980	C.I. 977		
C.I. 1049	Rio x Roman		
Giza	Winter-2		
L.G.G.-5	Y-T-30 (Flor)		
Punjab	463-4-1 (Flor)		
Rio			
Viking			
Y-3-2 (Flor)			
5585			

Variety and selection plantings in rows spaced 36 inches apart, made by Mr. J. P. Benson of the Producer's Cotton Oil Company, Fresno, were uniformly infected, and the most susceptible varieties were a complete loss from the standpoint of seed production, because of a curly-top infection of from 90 to 98%. Nineteen varieties planted in replicated 3-row blocks showed the curly-top reaction given in Table 1. Those listed as susceptible showed 80 to 95% infection, those slightly resistant 65 to 80%, moderately resistant 50 to 65%, and resistant 20 to 35%.

UNIVERSITY OF CALIFORNIA, COLLEGE OF AGRICULTURE, DAVIS

TESTS ON FLAX VARIETIES AND HYBRIDS FOR RESISTANCE TO ANTHRACNOSE

Byron R. Houston and Ernest H. Stanford

The anthracnose disease of flax, Linum usitatissimum L., caused by the fungus Colletotrichum lini Bolley, was present in serious proportions in the San Joaquin and Imperial Valleys of California in the 1940-41 and 1941-42 growing seasons. The damage amounted to a loss in yield as high as 60% in some fields. This extreme loss was the result of a high potential of infection accompanied by excessive spring rains during and after the blossoming period. Many plants were past blossom stage at this time and the infection on the capsules resulted in 50 to 85% infection of viable seeds in many fields.

Table 1. The relative resistance of 30 flax varieties to anthracnose, Colletotrichum lini.

Resistant	Moderately resistant	Slightly resistant	Susceptible
C.I. 1008	Argentine	Abyssinian C.I. 300	Bold C.I. 802
C.I. 1009	(Calar) C.I. 463	Dalgonetz C.I. 498	Indian Type 13
	Bison C.I. 389	Giza C.I. 378	Punjab C.I. 20
	Biwing C.I. 917	J.W.S. C.I. 880	
	Buda C.I. 326	Peerless C.I. 695	
	Cirrus C.I. 881	Saginaw x Ottawa 770B C.I. 687-1	
	Concurrent C.I. 801		
	Crystal C.I. 982	Bolley's Sel. C.I. 976	
	E.W. 100 C.I. 1010		
	Hercules	Bolley's Sel. C.I. 977	
	Linota C.I. 244	E.W. 180 C.I. 1006	
	Redwing C.I. 320	P.S. 1600 C.I. 1007	
	Rio C.I. 280		
	Royal C.I. 828		
	N.D. 100-16 C.I. 428		
	N.D. 114 C.I. 486		

Varietal tests were made under controlled conditions in the spring of 1941 in an attempt to find some resistant material to use in a breeding program to incorporate anthracnose resistance into the varieties best adapted to California. The first tests were made on 4- to 6-weeks-old plants by spraying them with a suspension of the anthracnose spores and keeping them in a cloth moist chamber for a period of 3 days. Ten days following inoculation the plants were separated into 4 groups on the basis of their susceptibility. This was determined by the number of infected leaves, number of stem infections, and total effect on the plant. The most susceptible varieties were in most cases completely killed within 2 weeks following inoculation. Later tests were made on plants in the small seedling stage. The inoculum was sprayed on the plants a day or two after their emergence. The plants and soil surface were then sprayed with water frequently for several days. In these tests an average of less than 1% of the seedlings of the most susceptible varieties

survived after a period of 10 days. These varieties were the Indian types, such as Punjab, which has been the variety most widely grown in California. There was a wide range of variation in the susceptibility of the other varieties tested. Certain plant selections of the 2 varieties C.I. 1008 and C.I. 1009 actually were immune from infection. The bulk seed of these 2 varieties had from 0 to 2% of the seedlings killed. The degree of resistance based upon seedling survival in this type of inoculation compares very favorably with that determined from older plant inoculations. This method possesses the added advantages of greater rapidity in testing, and of putting the degree of resistance on a numerical basis, thus eliminating the unavoidable errors that enter into the separation of the older inoculated plants into classes based upon a worker's judgment of severity of infection.

Some 80 varieties and selections have been tested to date. Table 1 shows the degree of resistance of some of the most common varieties. These results are based upon both seedling and 6-weeks-old plant inoculations.

For breeding resistance into the 2 most widely grown varieties in California, namely Punjab C.I. 20 and Argentine (Calar) C.I. 463, main reliance has been placed upon C.I. 1009 for the resistant factors. Certain selections of this variety are resistant to a degree where even cotyledon infections fail to occur. During the winter of 1942-43 a study of the inheritance of resistance indicated that 2 major factors produce the resistance found in C.I. 1009. This study is being continued.

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